

AMENDMENT AND RESPONSE

Serial Number: 09/828,460

Filing Date: April 6, 2001

Title: Passive Telemetry System for Implantable Medical Device

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3. (Once Amended) The system of claim 1 further comprising a receiver [in] incorporated as part of the implantable device for receiving a radio-frequency carrier modulated with digital data from [an] the external device.

4. (Once Amended) The system of claim 1 wherein the tuning circuit comprises a symbol encoder for encoding the [digital data signal] message data into corresponding voltage level symbols that are used to adjust the impedance of the implantable device antenna [for a specified symbol period] in a time varying manner so that the radio-frequency carrier signal is reflected with a phase-shift corresponding to each symbol.

6. (Once Amended) The system of claim [4] 5 wherein the voltage-controlled capacitance is a varactor diode.

7. (Once Amended) The system of claim 4 wherein the [digital] message data is encoded into binary symbols by the symbol encoder such that the reflected radio-frequency carrier is modulated with binary phase-shift keying.

8. (Once Amended) The system of claim 4 wherein the [digital] message data is encoded into four symbols by the symbol encoder such that the reflected radio-frequency carrier is modulated with quadrature phase-shift keying.

9. (Once Amended) The system of claim 4 wherein the external device receiver comprises a demodulator and a symbol decoder for recovering the [digital] message data from the reflected radio-frequency carrier signal.

10. (Once Amended) The system of claim 9 wherein the demodulator is a synchronous demodulator [that correlates the radio-frequency signal reflected from the implantable device with a locally generated reference carrier signal].

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11. (Once Amended) The system of claim 10 wherein the external device generates a reference carrier signal that is correlated with the reflected radio-frequency signal by the synchronous demodulator [implantable device periodically modulates the reflected radio-frequency carrier signal with alignment symbols having no phase shift in order for the external device receiver to generate a synchronized reference carrier signal].

12. (Once Amended) The system of claim 9 wherein the implantable device differentially encodes the [digital] message data such that symbols are represented in the modulated carrier by the phase change from one symbol period to another.  
elayed by a symbol period.

14. (Once Amended) The system of claim 13 wherein the tuning circuit phase modulates the radio-frequency carrier reflected from the implantable device [is modulated] with differential binary phase-shift keying.

15. (Once Amended) The system of claim 13 wherein the tuning circuit phase modulates the radio-frequency carrier reflected from the implantable device [is modulated] with differential quadrature phase-shift keying.

16. (Once Amended) A method for enabling data transfer from an implantable medical device to an external device, comprising:

transmitting a radio-frequency carrier signal from an antenna of the external device to an antenna of the implantable device;

adjusting the impedance of the implantable device antenna in a time varying manner so as to phase modulate [a] the radio-frequency carrier signal reflected therefrom in accordance with a digital data signal; and,

receiving the phase modulated carrier signal reflected from the implantable device antenna at the external device and extracting the digital data signal therefrom.

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17. (Once Amended) The method of claim 16 [wherein the frequency of the radio-frequency carrier signal and the dimensions of the antennas are] further comprising transmitting the radio-frequency carrier signal at a frequency such that a significant portion of the radio-frequency energy emitted by the external device antenna and reflected by the implantable device antenna is far-field radiation.

Please add the following claim:

24. The system of claim 11 wherein the implantable device, at specified times according to a predetermined communications protocol, modulates the reflected radio-frequency carrier signal with no phase shift in order to generate alignment symbols for use by the external device receiver in synchronizing the reference carrier signal to the reflected carrier signal.

REMARKS

In this response, claims 1, 3, 4, 6 – 12 and 14 – 17 have been amended and claim 24 has been added. As a result, claims 1-24 are now pending.

Claims 1 - 23 were rejected in the office action. Applicant addresses below each of the grounds of rejection applied to the claims.

Rejections Under 35 U.S.C. § 112

Claims 1-23 were rejected in the office action under 35 U.S.C. 112, second paragraph, as being indefinite. Claims 1-5, 7-8, and 10-19 have been amended herein in a manner believed to overcome the rejection. Reconsideration and withdrawal of the rejection are respectfully requested.

Rejections Under 35 U.S.C. § 102

Claims 1-7, 9, 10, and 16-20 have been rejected under 35 U.S.C. 102(b) as being anticipated by Weijand (U.S. Patent No. 5,999,857). Detailed responses to the rejections are provided as follows.

*Claim 1*

Applicant respectfully traverses the rejection of claim 1. Among other things, applicant is unable to find in Weijand a teaching or suggestion for a system for transferring data which includes a tuning circuit for adjusting the impedance of an antenna in a manner that phase modulates a carrier signal reflected by the antenna, as recited by independent claim 1. In contrast, Weijand relates to transmissions by inductive coupling of transmit and receive antennas. The rejection of claim 1 is thus traversed and reconsideration is respectfully requested.

*Claims 2 - 7, 9 and 10*

Applicant further finds no teaching or suggestion in Weijand for any of the limitations recited by dependent claims 2-7, 9 and 10 in the context of such a system or method. The comments in the office action regarding the antenna dimensions and carrier signal frequency suggested by Weijand as being capable of meeting the claimed limitations are specifically disputed with respect to claim 2. Applicant finds no teaching or suggestion in Weijand for the use of far-field radiation to transfer data. The rejections of claims 2 - 7, 9 and 10 are thus traversed and reconsideration is respectfully requested.

*Claim 16*

Applicant respectfully traverses the rejection. Among other things, Applicant is unable to find in Weijand a teaching or suggestion for transferring data by adjusting the impedance of an antenna in a manner that phase modulates a carrier signal reflected by the antenna, as recited by independent claim 16. In contrast, Weijand relates to transmission by inductive coupling of transmit and receive antennas. The rejection of claim 16 is thus traversed and reconsideration is respectfully requested.

*Claims 17 - 20*

Applicant further finds no teaching or suggestion in Weijand for any of the limitations recited by dependent claims 17 - 20 in the context of such a system or method. The comments in the office action regarding the antenna dimensions and carrier signal frequency suggested by Weijand as being capable of meeting the claimed limitations are specifically disputed with

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respect to claim 17. Applicant finds no teaching or suggestion in Weijand for the use of far-field radiation to transfer data. The rejections of claims 17 - 20 are thus traversed and reconsideration is respectfully requested.

Rejections Under 35 U.S.C. § 103

In the Office Action, claims 8, 11-15, and 21-23 were rejected under 35 U.S.C. 103(a) based upon the Weijand reference.

*Claim 8*

With respect to claim 8, the office action states that Weijand discloses all of the recited limitations but does speak directly to the use of QPSK. It is respectfully submitted that Weijand does not teach or suggest transferring data by modulating a reflected carrier, and applicant finds no teaching or suggestion in Weijand for the use of QPSK in that context. The rejection of claim 8 is thus traversed and reconsideration is respectfully requested.

*Claim 11 and 21*

With respect to claims 11 and 21, the office action states that Weijand discloses all of the recited limitations but does speak directly to a clock signal embedded in the RF carrier signal. It is respectfully submitted that Weijand does not teach or suggest transferring data by modulating a reflected carrier, and applicant finds no teaching or suggestion in Weijand for a clock signal embedded in the RF carrier signal in that context. The rejections of claims 11 and 21 are thus traversed and reconsideration is respectfully requested.

*Claims 12- 15, 22 and 23*

With respect to claims 12-15, 22, and 23, the office action states that Weijand discloses all of the recited limitations but does speak directly to the use of differential PSK or QPSK. It is respectfully submitted that Weijand does not teach or suggest transferring data by modulating a reflected carrier, and applicant finds no teaching or suggestion in Weijand for the use of differential PSK or QPSK in that context. The rejections of claims 12-15, 22, and 23 are traversed and reconsideration is respectfully requested.